RECENT EXPERIENCE IN THE DIAGNOSIS AND TREATMENT OF CRANIAL AND SPINAL INJURIES.[1]

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Four Cases of Extradural Hæmorrhage; One Case of Penetrating Pistolshot Wound of the Cranium; Two Cases of Fracture of the Base of the Cranium; One Case of Cerebral Hæmorrhage.

THE progress of knowledge in the matter of cerebral localization, and the revival of interest in attempts to institute operative relief in certain cases of injury or disease of the spinal cord, give at the present time a special interest in studies both of disease and injuries of the cranio-spinal skeleton and its contents. For this reason I venture to report in the following paper a limited series of cases of injuries of the cranium and spine which have come under my personal observation during the past year, in the study and treatment of which an attempt was made on my part to utilize the most recent additions to diagnostic means and operative resources. That in most of them a fatal result was not prevented, and in some of them the post-mortem examination was required in order to accurately establish the diagnosis of the character and extent of the injury, is simply acknowledging what is to be expected in such a class of injuries, in which the lesions are often multiple and diffused, and involve the centres of life.

I have to report four cases of extradural hæmorrhage, one cranial and three vertebral, all terminating fatally; one penetrating pistolshot wound of the cranium, terminating in recovery, and two fractures of the base of the cranium, one with recovery and one with death. Was this report intended to discuss the general subject of fractures of the base of the cranium yet other cases would have to be included, some of recovery but in which the proof of there having existed a fracture of the base is not absolute, and others of death, but so speedily from the immediate shock of the overwhelming injury as to prevent the development of such special symptoms as might make them of interest in a study of the present character.

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EXTRADURAL HÆMORRHAGE.

The first case is as follows:

Linear Fissure of Left Parietal Bone without External Wound; Laceration of Middle Meningeal Artery; Extensive Extra-dural Hæmorrhage; Death.

A man, æt. 45 years, was admitted to the Methodist Episcopal Hospital in the afternoon of December 25, 1888, in a condition of profound coma, with the following history: About sixty hours before he had been struck twice on the head with a kind of a wooden mallet, known as a bungstarter. Though felled by the blow, he was afterward able to rise and to walk some distance to his home, with the assistance of two companions. Some nine hours later he was first seen by a physician who found him comatose, but not so deeply but that shaking and sharp speech would rouse him partially. His pupils at the time were both firmly and evenly contracted. Twenty-four hours later the coma was less profound, he had made a voluntary successful effort to urinate, some right-sided paralysis was noted. By the next day, however, the coma had again become profound, for which reason the patient was sent to the hospital. I saw him at 5 P.M., being a few hours after his admission. His pulse was 80, and full; his respirations were 20 per minute, with tendency to snoring; his skin was warm; both pupils were alike and normal in appearance, but did not respond to stimuli; repeated and careful tests of the reflexes and of sensation over the body were unsatisfactory in their results. The patellar reflex seemed somewhat exaggerated on both sides. There was well-marked ankle and wrist clonus. There seemed to be slight paresis of the right limbs and of the left side of the face, but firm pressure on the supraorbital nerves at the notch in the parietal bone elicited movements of limbs on both sides of the body, most marked on the right. Careful examination of the shaven head by myself and a number of my colleagues of the hospital staff could discover not only no depression or other irregularity to show a lesion of the skull, but there was not even a sign of external bruising apparent to show upon what part of the head the blows had been inflicted.

Here was truly a perplexing case. The man had been the victim of a murderous assault; he was evidently suffering from cerebral compression, the result of intracranial hæmorrhage. The rightsided paralytic symptoms which had been reported as noted on the second day after the injury suggested a lesion over the left hemisphere, but the report as to this symptom was indefinite and uncertain, and was contradicted by the activity of the right-sided movements elicited by supraorbital pressure, and by the normal symmetrical condition of the eyes. He had sustained a blow with a blunt weapon, presumably on the vertex; it was possible that the chief injury had been inflicted upon the opposite side, viz., at the base, and that the hæmorrhage was from one of the vessels in that region. The localizing symptoms were not distinct; I was in doubt; the man's general condition was not apparently immediately threatening; I decided to wait for the development of symptoms that might enable me to more clearly localize the trouble. Directions were given that should any change occur I should be notified at once. It was understood with my colleagues who were in consultation with me that, in default of the development of any distinctly localizing symptoms, if any change for the worse in the general condition of the patient should occur exploratory trephining should at once be instituted at the lower anterior angle of the parietal bone, first on the left side, and if that should be fruitless, on the right side, with a view to ascertaining whether one of the middle meningeal arteries might possibly be the source of the hæmorrhage, and if so, to its proper treatment.

During the immediately succeeding hours there was a gradual change for the worse in the patient; his respirations became slower by degrees and more stertorous until they were only 8 per minute. Œdema of the lungs developed; the pupils became widely dilated, and he died by respiratory failure at five o'clock in the morning, being twelve hours after I had examined him. Meanwhile no message was sent to me as to his condition, and I thus had no opportunity to carry out the plan of exploratory trephining agreed upon in the consultation. This is the more to be regretted for, had this been done, the revelations of the post-mortem table showed that the source of the hæmorrhage would have been uncovered, and a correct diagnosis at least would have been arrived at before death. Whether the ultimate fatal result would have been changed, I doubt. The autopsy revealed a linear fissure of the left parietal bone, beginning near the vertex, about ¾ inch to the left of the sagittal suture,and about 1½ inch behind the coronal suture and running downward and forward into the temporal region bisecting the anterior inferior angle of the parietal as far as its articulation with the sphenoid. The lower half of its course involved the groove in which lay the large anterior branch of the middle meningeal artery, which vessel was lacerated causing an immense circumscribed extradural extravasation which had formed a blood-tumor measuring five inches from before backward, four inches from above downward and an inch thick in its centre. This had made a bed for itself by depressing the lateral convexity of the cerebrum, compressing chiefly the lower parietal and upper temporal convolutions. The brain was normal. There was no lesion at the base.

In this case it is evident that I did not give sufficient weight to the symptoms of right-sided paralysis which had been noted by his physician the day before his admission to the hospital. This was the only definite clue which the case presented, and under the circumstances was certainly sufficient to have warranted an exploratory trephining, with the anterior inferior angle of the left parietal bone as the point of election.

In this connection, an observation may be permitted as to the course of operative procedure in cases of extradural hæmatoma of the temporal region. Kronlein's recent memoir[1] on this subject, based upon the study of 280 cases, gives much valuable data upon this point. Kronlein describes four varieties of hæmatomata, arising from rupture of the middle meningeal artery, divisible into two general groups. The first group, diffuse hæmatomata, may extend as an even layer over the inner surface of an entire half of the skull; the second group, by far the most numerous, are circumscribed and lenticular in form, and are capable of subdivision by location into fronto-temporal, parieto-temporal and parieto-occipital, according to the portions of the cerebrum which they compress. The most frequent forms are the parieto-temporal, situated over the middle cerebral convexity, bounded in front by the edge of the lesser wing of the sphenoid, posteriorly by the free margin of the petrous portion of the temporal, and extending from the region of the foramen spinosum below and upward a variable distance toward the vertex.

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[1] Deutsch. Zeitschr. f. Chir., Bd. 23, Hft. 3 and 4, March, 1886.

It is possible that a given case may present localizing symptoms sufficient to indicate to the surgeon the variety of hæmatoma with which he has to deal, from the cortical areas shown to be affected. In such cases the point at which the trephine shall be applied is indicated with considerable accuracy, but in those far more frequently occurring cases in which by reason of complications involving other areas of the brain, the localizing symptoms are confused, or by reason of the wide extent and mass of the compressing clot, they are held in abeyance, as in my own case, the problem is less simple, and the surgeon must be guided by general principles in his attack. A perforation made in the temporal region, through the anterior inferior angle of the parietal bone, gives access, as Kronlein points out, to the areas of the diffuse, the temporo-parietal and the fronto-temporal hæmatomata, and is, therefore, the point of election for exploratory perforation in all doubtful cases. The location of this point is easily effected. It is from $1^1/_4$ to $1^1/_2$ inches behind the external angular process of the frontal bone, on a line drawn backward from the superior margin of the orbit parallel with a line drawn from the inferior margin of the orbit to the entrance to the external auditory meatus.

If this first perforation prove fruitless, a parieto-occipital hæmatoma is to be sought for by a second trephine perforation, made in the region of the posterior branches of the middle meningeal artery. The most favorable point for this second perforation is on the same line as the first, prolonged backward, at its intersection with a vertical line carried upward directly behind the mastoid process. A second opening of this sort is advised by Kronlein to be made in case of diffuse hæmatoma to permit the more thorough removal of the coagula, and to ensure complete drainage. In such a case as my own, this double opening would have been imperative for the adequate relief of the conditions present, and for its subsequent cure. I know of no instance, as yet, where this recommendation has been carried out in practice, but its reasonableness and necessity in certain cases must command the assent of surgeons.

CASE II.—*Dislocation forward of sixth cervical vertebra; extradural hæmorrhage; sudden death.*

A robust young man, æt. 26 years, was brought to the Methodist Episcopal Hospital at 9 A.M., May 16, 1888, with a history of having been found in an empty apartment, in an insensible condition; it was supposed from his surroundings that he had fallen headlong through an open skylight above upon the floor where he was found. Upon admission he was comatose and in profound shock, his temperature reaching only 94.8° F. Examination at that time demonstrated persistent priapism with absence of patellar and scrotal reflexes. By the aid of stimulants and heat reaction was gradually secured, with slow return of consciousness. It was now found that there was complete motor and sensory paralysis of the lower extremities with marked, but not absolute, paralysis of the upper extremities. The pulse improved, with gradual rise of temperature to 100° F. Pain and tenderness in the lower cervical region posteriorly indicated that point as the seat of injury. About twenty hours after admission symptoms of collapse suddenly developed, as manifested by heart failure, rapid, feeble and labored respiration, free sweating and unconsciousness. From this he was rallied, however, and for a few minutes his pulse was again strong and regular, his skin natural and his intellect clear; with equal suddenness a second collapse supervened, the symptoms terminating in death in twenty minutes. The autopsy revealed a dislocation forward of the sixth cervical vertebra, sufficiently to partly occlude the lumen of the spinal canal. A considerable quantity of fluid and clotted blood lay posterior to the cord outside of the dura within the canal, extending both upward and downward for some distance from the point of lesion.

The symptoms are those of recurring hæmorrhage from a lacerated meningeal vessel; held in abeyance by the collapse following the original injury, the clot sealing the vessel was at last forced aside by the increasing blood pressure attending the establishment of reaction; again checked for a few minutes by the second collapse, the bleeding finally burst through again, with the fatal result recorded. Such a case as this gives no opportunity for surgical interference, although the indications are distinct for trephining the laminæ for relief of the blood pressure, if time for such a procedure could be secured before the occurrence of the fatal catastrophe.

CASE III.—*Fracture of the spine at junction of dorsal and lumbar regions; pulpification of spinal cord; extradural hæmorrhage at site of fracture and in upper dorsal region; rapidly ascending paraplegia; trephining of spinal canal; death.*

A robust man, æt. 35 years, was admitted to the Methodist Episcopal Hospital at 9 A. M., July 10, 1889, having just been injured by the fall of a bank of earth upon his back. A fracture of the spine at the junction of the dorsal and lumbar regions was evident. Total paralysis, sensory and motor, of the lower extremities was present. Pain in the epigastrium and abdomen was complained of. The surface anæsthesia in front reached to within 2½ inches below the level of the anterior superior iliac spines, corresponding quite accurately to the upper limit of the distribution of the branches of the lumbar plexus. During the next twenty-four hours this area of anæsthesia ascended until it reached the level of the umbilicus. It remained nearly stationary at this point for three days. It then took another jump upward, reaching in twenty-four hours the level of the xiphoid appendix. From this point it continued to creep slowly upward at the rate of about 2 inches each twenty-four hours, so that by the eighth day after the accident the area of anæsthesia had reached a point 12½ inches above the anterior iliac spinus. Meanwhile the general condition of the patient had been fairly good. His intellect was clear. He had taken food well: his bowels had responded to enemata, and his bladder had been emptied at regular intervals by catheter. Bloody urine indicated some kidney lesion. On the sixth day, however, he had a severe rigor with rise of temperature to 102.6°F. On the eighth day a second rigor with similar rise of temperature occurred. The treatment up the present time had been purely expectant. Careful examination of the spine did not show any depression of the laminæ or spines at the seat of the fracture. The extent of anæsthesia noticed on admission was evidently the immediate result of the injury; the extension noticed during the first twenty-four hours was the natural result of the traumatic congestion and effusion of that part of the cord in the immediate vicinity of the original wound. The rapid ascent of the line of anæsthesia on the fifth day, and its steady creeping upward thereafter introduced a new element into the case.

Was it due to a steadily extending inflammatory degeneration of the cord? If so, the teaching of Brown-Sequard that such extending lesion is usually due to the continued irritation of the cord by pieces of broken bone, gave a clear indication for exploratory trephining at the site of the fracture. Was it due to hæmorrhage within the canal, forming a gradually extending hæmatoma, creeping upward with pressure upon the cord as it ascended? Such a theory was plausible and consistent with the symptoms. If so, the indication for operative interference was equally plain.

The change for the worse in the general state of the patient as indicated by the rigors and fever of the sixth and eighth days gave urgency to the indications for interference. I, therefore, on the eighth day, operated as follows: By the usual longitudinal incision in the midline of the back, the lower dorsal and upper lumbar spines were exposed and the gutters on either side were cleared of their muscular contents, so as to expose the laminæ. The line of fracture was through the dorso-lumbar articulation with fracture of spine and laminæ of the last dorsal vertebra, but without depression or displacement. The supra and interspinous ligaments, together with those binding the laminæ together were practically intact. The spines and laminæ of the lower dorsal and of the upper lumbar vertebræ were then removed by means of a rongeur. This exposed a layer of partly organized bloodclot, about a line (or 2 mm.) in thickness, lying external to and upon the dura mater of the cord, and extending downward as far as the canal was opened. The spines and laminæ of two more of the dorsal vertebræ were then removed; the original clot did not extend above the line of fracture. No fresh effusion of blood was revealed. No laceration of the dura was present. Palpation showed the cord to be soft within its sheath. No irritating spiculæ of bone and no effusion of blood in sufficient amount to cause compression symptoms was found. The dura was not opened. The wound was therefore closed. The patient rallied well from the operation. During the following day there was no further extension of the anæsthesia. His bowels moved spontaneously three times. During the next day he began to fail, and finally died by asthenia near its close, being ten days after the original injury and about thirty-six hours after the operation.

The autopsy showed that the softening of the cord reached upward to the seventh dorsal vertebra; above this point it was normal. In addition there was a second extradural hæmatoma in the upper dorsal region, extending from the level of the fifth dorsal to that of the seventh cervical. There was a laceration also of the left kidney.

CASE IV.—*Fracture of the spine in the mid-dorsal region: Pulpification of the cord with intra-medullary hæmorrhage; extensive extradural extravasation. Death.*

A robust sailor, æt. 29 years, was admitted to the Methodist Episcopal Hospital, October 1. 1889, on account of injury received by a fall of about 18 feet, striking upon the back of his head, neck and shoulders. He was perfectly conscious, breathing easily, but with total motor and sensory paralysis of both lower and upper extremities. The line-of anæsthesia in the trunk was about the level of the second rib, on the arms at the insertion of the deltoid, being alike on both sides. There was marked priapism. A fracture of the spine could be made out in the region of the seventh dorsal vertebra; pressure over the lower cervical vertebræ elicited deep tenderness; no displacement. The back was much contused. The case came under the care of my colleague, Dr. Fowler, through whose courtesy I am permitted to embody it in this report. I saw the case with Dr. Fowler shortly after its admission, and shared in the responsibility of the treatment adopted. Immobilisation of the head and upper spine was effected by a plaster-of-Paris cuirass extending from the lumbar region upward above the occiput. Temperature steadily rose from the normal point at which it stood on admission, at the rate of nearly half a degree per hour; respiration became irregular and catchy, with final death by respiratory failure about twenty-four hours after admission, with a temperature of 109°F. The autopsy demonstrated complete fracture of the spine between the seventh and eighth dorsal vertebræ, with fracture of the laminæ of the seventh and eighth vertebræ, and the spines of the sixth, seventh and eighth dorsal vertebræ, and of the seventh cervical. The spinal cord was pulpefied at the eighth dorsal vertebra. The extradural space of the upper portion of the spinal canal was filled with coagulated blood. Multiple points of intramedullary hæmorrhage existed in the upper dorsal portion of the cord.

But little encouragement is derivable from these few cases that I have recited for operative interference in cases of recent traumatism of the spine. I am, however, far from accepting the sweeping condemnation with which Jonathan Hutchinson and Le Gros Clark have declared all such operations unjustifiable. The reasons which prompted me to operate in the one case in which I did interfere, I believe to have been valid and sufficient, notwithstanding the fact that no special benefit accrued to the patient from the attempt. Fractures of the spine, in which the lesion is caused by a force which acts only upon a very limited segment of the column, evidently form a class much more likely to present conditions amenable to operative interference than cases in which the injuring force is more diffused. The injury to the cord will be much more limited in extent; the presence of depressed fragments pressing into or upon a wounded cord is more likely to exist; no extensive resections of the posterior arch of the canal will be required. And those cases in which the bone injury is limited to the spinous processes and laminæ, form a class which should be distinguished clearly, as regards the possibilities of advantage by operative interference from the cases in which there is complete fracture through the bodies of the vertebræ. As is well understood, in many cases of complete fracture—illustrated in the two cases above detailed—the soft structures which bind the bones together posteriorly are not ruptured, and continue to form a most important bond to prevent displacements in the subsequent history of the case. To divide these, as is necessary if the spinal canal is to be opened, entails the destruction of this means of support which can not be adequately substituted, and is a sacrifice which ought to be made with great caution and only on the clearest evidence of the existence of a more imperative indication. This point was impressed upon me by observations that I was able to make in Case 2.

If, however, the bodies are intact, or if the case has progressed to a period in which consolidation of any fracture involving them has occurred, then the posterior arch may be attacked without seriously increasing the hazards of the case.

Gunshot fractures of the vertebræ form yet another class, one in which there is the special indications arising from a compound fracture probably septically infected, for immediate enlargement of external wound, removal of fragments of bone, disinfection and drainage.

CASE V.—*Penetrating pistol-shot wound of cranium. Ball lodged within cranial cavity. Drainage. Recovery.*

A man, æt. 43 years, was admitted to the Methodist Episcopal Hospital, July 13, 1889, suffering from a self-inflicted pistol shot wound (32 calibre) in the right temporal region. He was semi-conscious, and suffering considerably from shock. The patient was at once placed upon the operating table and the necessary cares given him by the house-surgeon, Dr. H. W. Cardwell. The whole head was shaven and purified. The wound of entrance was at a point one inch behind, and three inches above the external angle of the eye. The skin wound was freely enlarged with the knife and a corresponding opening in the cranium uncovered, which was found to be surrounded by a thin rim of lead which had been scraped from the bullet in transit. A blunt and light probe gently insinuated into the bullet track, passed into the brain some four inches inward and downward in the direction of the crista galli. A small drainage tube was inserted and gentle injections with boro-salicylic solution were made. An absorbent pad completed the dressing. The subsequent history of the case is comparatively uneventful. Some restlessness and headache for the first two days were succeeded by stupor on the third day which after twenty-four hours more had given way to some delirium. These symptoms with rise of temperature to 101° F., marked the immediate circumscribed traumatic cerebritis along the track of the bullet. After the fourth day, the temperature declined to 100°. Slight dischage of serum mixed with broken down brain matter came away bv the drainage tube. On the eighth day the patient in his delirium pulled off the dressings and with them the drainage tube. The tube was not reintroduced. From this date he steadily improved. The external wound healed kindly. By the eleventh day he was quite rational. A tendency to right-sided facial paralysis, with dilatation of right pupil meanwhile had begun to appear which by the fifteenth day was quite marked. On August 13, 23 days alter admission, the patient left the hospital recovered. His paresis was diminishing.

CASE VI.—*Fracture of the base of the skull. Recovery.*

A gentleman, æt. 33 years, was brought to the Methodist Episcopal

Hospital, May 5, 1889, in a condition of profound shock, with free hæmorrhage from the left ear, and from the nostrils. He had a few minutes before been thrown from his horse in Prospect Park. He vomited copiously, the vomited matter containing blood. There was no paralysis; all the reflexes were present but diminished in intensity. The discharge of blood and serous fluid from the left ear continued to be copious. He soon fell into a stupor, with alternating paroxysms of delirium. Bichloride irrigations of the left external auditory canal with light tamponade with iodoform gauze were instituted. Stimulants till reaction; then bromides and morphia to control restlessness and delirium.

By the second day notable sensory and muscular paresis of the left side of the face was evident. On the fifth day there were twitchings of the upper lip and right side of the face, with more marked left-sided facial paralysis. On the sixth day there was general skin hyperæsthesia and photophobia. By the ninth day the temperature which had been gradually rising for some days, reached 102° F. There was marked Cheyne-Stokes respiration, and threatening collapse; a bloody discharge from the ear still continues. He rallied, however, from the collapse, and from this time steadily improved. The temperature fell to the normal point. The restlessness and delirium, for a time great, became less marked with lucid intervals, and finally on the twenty-third day after the injury, the patient was discharged from the hospital, still with tendency to incoherence, and with facial paresis unchanged. Entire recovery of mental balance gradually came about after his return home.

CASE VII.—*Fracture of the base of the skull; convulsions; trephining; death.*

A man, æt. 43 years, was brought to the Methodist Episcopal Hospital, May 15, 1889, having sustained an injury to his head by falling from a scaffold. He was wildly delirious and restless, with free bleeding from the right ear. The right side of the face was partially paralyzed, and the right eye was dilated. There was hyperæsthesia of the whole surface of the body. The reflexes in the left side of the body were diminished in activity. There was a small scalp wound in the right temporo-occipital region. Scalp was shaved and the wound explored, but without finding any fracture associated with it. For two days patient's condition remained about the same. The bleeding from the ear was considerable. The restlessness and delirium were controlled by morphia. Urination was involuntary.

At 5:20 A.M. of the third day, patient had a severe convulsion, and continued to have them at short intervals until by noon seventeen paroxysms had occurred. Each paroxysm was identical with the rest. Each began by a deviation of both eyeballs strongly to the left; the whole head then turned to the left; then followed violent convulsive movements of the right orbicularis oculi. Next the left hand exhibited convulsive movements beginning in the thumb, followed by convulsion of all the muscles of the left upper extremity. These lasted for a few seconds. Then all the convulsive movements subsided, then the eyes were strongly deviated to the right. Finally the eyes assumed their natural positions. A period of rest for some minutes would then intervene, after which the same series of convulsive movements would be gone through with again.

No clear indications for attack could be drawn from these irritative symptoms as far as the established facts in cerebral localization were available. The conjugate deviation of the eyes with the deflection of the head to the left indicated cortical irritation in the region of the left middle frontal convolution just anterior to the ascending frontal; but the left hand and forearm movements indicated simultaneous irritation of the cortex of the middle of the right ascending frontal. The convulsions of the right orbicularis oculi, and the final conjugate deviation of both eyes to the right, also indicated a right-sided irritation.

The chief irritation however was evidently upon the right side. The hæmorrhage from the right ear also showed that a line of fracture was running across the middle fossa of the skull on the right side. In reflecting upon the conditions attending fractures of the base of the skull I had previously formulated a plan for instituting drainage of the middle fossa in the earliest stages of meningitis supervening upon such fractures by trephining the temporal bone just above the external auditory meatus. In the present instance it seemed to me that the convulsive symptoms were the result of irritation that was inflammatory in its origin; the primary focus was probably adjacent to the lesion of the temporal bone, and that the peculiar convulsive explosion simply indicated the point to which the inflammatory congestion had progressed. I accordingly determined to open the right middle fossa at the point where it was most accessible just above the external auditory meatus. This I proceeded at once to do. No sooner was the cranial wall exposed by the turning down of a suitable flap than a line of fracture through the squamous portion of the temporal, running inward to the base, became visible. A button of bone adjacent to this fissure was removed. The dura, which was lacerated, was reflected. There now came into view a cavity of some size, containing blood clot, fluid blood and broken-down brain tissue. Gentle irrigations were used to cleanse this as well as possible. A drainage tube was introduced and the external wound closed.

After the operation the convulsions contined as before to the number of ten; they then ceased. But the coma became gradually more profound. Œdema pulmonum supervened and at the end of nine hours the patient died.

The autopsy revealed in the right temporal lobe beneath the seat of operation a circumscribed area of softening measuring two inches in diameter in the middle of which was a cavity extending on inch inwardly; a thin layer of rather dense blood clot covered the surface of the temporal lobe, with some softening of brain underneath it. Effused underneath the dura mater over the posterior convexity of the right half of the cerebrum, extending as far forward as the anterior frontal convolution, was a thin recent blood clot There was a blood clot, of less extent, at the base of the right frontal lobe Into the left convexity of the pia mater there was an effusion of blood, with superficial softening of the cortex of the second temporal convolution over an extent of nearly three inches backward from the fissure of Sylvius.

CASE VIII.—*Cerebral hæmorrhage with symptoms simulating cranial injury; trephining; detection and opening of subdural hæmorrhagic effusion; death.*

A lady, æt. 60 years, was found insensible at the foot of a flight of stairs down which she had evidently fallen. The right clavicle was fractured. Slight bleeding from the right ear indicated at least a fracture of the tympanum on that side. She presented profound coma for the first few hours, gradually becoming lighter, attended with no inequality of the pupils and no paralysis. By the third day conscious intelligence had been regained. During the fourth day complete right hemiplegia developed, with profound coma and collapse. The symptoms were those of intracranial hæmorrhage on the left side. The possibility of the source of this being the middle meningeal artery was sufficiently great to justify in my opinion exploratory trephining in the line of its track. Should the hæmorrhage be from this source, and the pressure symptoms be caused by an increasing extradural clot, the turning out of the clot and the arrest of the hæmorrhage might yet save the patient. Accordingly after turning down a flap of the scalp so as to expose the left temporal region, I applied the trephine at the point demonstrated by Krönlein, viz., one and a half inch behind the external angular process of the frontal bone on a line drawn backward from the superior margin of the orbit parallel with a line drawn from the inferior margin of the orbit to the entrance to the external auditory meatus. On removing the button of bone the localization of the artery was found to have been exact for its groove bisected the under surface of the button. There was no extradural hæmorrhage revealed however, but the bulging of the dura, with a bluish discoloration, led me to incise the dura, whereby a clot of blood was disclosed. The opening in the cranial wall was now enlarged posteriorly by the removal of another button, and the dural flap turned back over the whole area exposed. An extensive apoplectic effusion was now disclosed consisting of blood clot, fluid blood and broken down brain tissue, its external portion, being the part uncovered, occupying the lower temporal convolutions. The hopelessness of the case was evident and there was nothing left to do, after removing the more superficial portion of the effusion, but to provide for drainage and replaçe the scalp flaps. No benefit was derived from the operation. The patient was returned to her bed, where she shortly expired by respiratory failure.

The results in these cases are calculated to prevent the indulgence of too sanguine expectations in approaching similar cases. Nevertheless, although, in the great majority of cases, either the extent or the seat of the lesion will render all attempts at surgical relief futile, yet in some cases, intracranial conditions susceptible of relief and cure do exist, and in any case in which a reasonable doubt exists, it seems to me to be justifiable to give the benefit of the doubt to the patient, especially when it is evident that without intervention a fatal termination is certainly imminent.